

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
6 January 2005 (06.01.2005)

PCT

(10) International Publication Number  
**WO 2005/001889 A2**

(51) International Patent Classification<sup>7</sup>: **H01L**

(21) International Application Number:  
PCT/US2004/013119

(22) International Filing Date: 28 April 2004 (28.04.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/468,729 7 May 2003 (07.05.2003) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **ALLOYED SEMICONDUCTOR QUANTUM DOTS AND CONCENTRATION-GRADIENT ALLOYED QUANTUM DOTS, SERIES COMPRISING THE SAME AND METHODS RELATED THERETO**

(57) Abstract: An alloyed semiconductor quantum dot comprising an alloy of at least two semiconductors, wherein the quantum dot has a homogeneous composition and is characterized by a band gap energy that is non-linearly related to the molar ratio of the at least two semiconductors; a series of alloyed semiconductor quantum dots related thereto; a concentration-gradient quantum dot comprising an alloy of a first semiconductor and a second semiconductor, wherein the concentration of the first semiconductor gradually increases from the core of the quantum dot to the surface of the quantum dot and the concentration of the second semiconductor gradually decreases from the core of the quantum dot to the surface of the quantum dot; a series of concentration-gradient quantum dots related thereto; in vitro and in vivo methods of use; and methods of producing the alloyed semiconductor and concentration-gradient quantum dots and the series of quantum dots related thereto.

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